Rates of malnutrition identified during hospital admissions and related length of stay for people with mental illness: a population-wide data linkage study

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Rates of malnutrition identified during hospital admissions and related length of stay for people with mental illness: a population-wide data linkage study.

Running title: Malnutrition in people with mental illness.

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List of Abbreviations.

aIRR – Adjusted

BMI – Body Mass Index

CI – Confidence Intervals

ICD-10 – International Classification of Diseases, 10th Edition

IRSD – Australian Bureau of Statistics Index of Relative Socioeconomic Disadvantage

NSW – New South Wales

STROBE – Strengthening the Reporting of Observational Studies in Epidemiology

Abstract

Background & aims. People with mental illness experience numerous risk factors for malnutrition, however, the rate and impact of malnutrition in this population group have not been examined. We aimed to determine the rates of malnutrition identified during hospital admissions and the associated length-of-stay in mental health service users compared to non-mental health service users.

Method. In a population-wide data linkage study, malnutrition diagnoses made during hospital admissions and associated bed-days were examined for mental health service users compared to non-mental health service users between 2017 and 2019. Primary and secondary outcomes were crude and standardized rates of malnutrition and associated bed-days, respectively, presented as incidence and days per 100,000 person years. Sensitivity analyses assessed the contributions of: (i) eating disorder diagnoses, (ii) organic mental disorders, and (iii) admissions for mental health care.

Results. Mental health service users were admitted with malnutrition 3,526 times per 100,000 person years. This rate was higher than for non-mental health service users, who experienced 593 admissions per 100, 000 person-years. In the fully adjusted model (aIRR), mental health service users had 7.76x (95% CI 7.74-7.77) higher rates of malnutrition being identified during an admission and 11.44x (95% CI 11.43-11.44) higher bed-days for those admissions compared to non-mental health service users. Excluding people with an eating disorder diagnosis had little effect on incidence of malnutrition (aIRR=7.35, 95% CI 7.34-7.37) or bed-days (aIRR=10.80, 95% CI 10.79-10.80). Excluding hospitalizations for organic mental disorders produced similar estimates (malnutrition aIRR= 7.65, 95% CI 7.63-7.67; bed-days aIRR= 11.24, 95% CI 11.23-11.24). Excluding malnutrition diagnosed during a non-organic mental health care admission reduced the incidence rates of malnutrition diagnoses being identified during hospital admissions (aIRR=6.33, 95% CI 6.31-6.35) and bed-days (aIRR=8.08, 95% CI 8.07-8.08), though rates remained significantly higher compared to non-mental health service users.

Conclusion. Mental health service users are at higher risk for malnutrition being identified during a hospital admission, irrespective of whether the admission was for an episode of mental or physical health care. Strategies for prevention and early-identification are needed for this population group.

Key words. Malnutrition, Diet, Nutrients, Mental Disorders, Mental Health.

Introduction

People with mental illness experience a myriad of physical health problems at higher rates than people without mental illness [1]. These problems are related to symptoms and characteristics associated with mental illness, psychotropic medication side-effects, unfavorable lifestyle behaviours, poor access to health services and diagnostic overshadowing. Additional contributing factors include social exclusion, low socioeconomic status, stigma and discrimination [2]. Physical health conditions are the primary cause of early death in people with mental illness [3], contributing to a 12-to-16-year mortality gap compared to the general Australian population [4].

Nutritional status is often compromised in people with mental illness. Much of the available literature focuses on hyperphagia linked to psychotropic medications [5] and disordered eating behaviours, such as binge and emotional eating [6, 7]. These may drive high-energy low-nutrient diets [8, 9], contributing to high rates of chronic disease and premature mortality [3]. However, people with mental illness are also at greater risk for malnutrition across the weight spectrum due to factors including food insecurity [10], sedation from medication [11], amotivation [12], food aversions and other restrictive behaviors a [13], and poor dentition [14].

A growing literature has examined nutrition and malnutrition risk in mental health settings. These studies consistently indicate a high prevalence of nutritional risk in both inpatient and community mental health populations [15]. For example, a 2022 Swiss study found that a substantial proportion of people with mental illness in both inpatient (32%) and outpatient settings (34%) were at risk of malnutrition as assessed by the Mini Nutritional Assessment-Short Form [16]. However, malnutrition

risk screening reflects the likelihood of inadequate intake or nutritional vulnerability and does not equate to clinically diagnosed malnutrition.

To date, few studies have examined the occurrence of clinically diagnosed malnutrition among people with mental illness using routinely collected hospital data. To our knowledge, no population-wide data linkage studies have quantified rates of malnutrition diagnoses being coded during an episode of care and associated number of hospital bed-days in this population group. This study aims to determine the rates of protein-energy malnutrition identified during hospital admissions and associated bed-days for mental health service users compared to non-mental health service users. Second, we aim to determine whether rates differ between people with severe and persistent mental illness and those with other mental illnesses.

Material and Methods

Study Design. This population study used linked data from residents of New South Wales (NSW), Australia. This study identified all hospital admissions to NSW public or private hospitals with a primary or secondary diagnosis of malnutrition between 1 January 2017 to 31 December 2019**.** Ethics approval was granted by the NSW Population and Health Service Research Ethics Committee (HREC/17/CIPHS/48. CINSW Refs 2017/HRE1105, 2019/UMB0208). Oversight was provided by a steering committee which included representatives from peak organizations for NSW Health consumers, mental health service users, and mental health carers.

Setting. Australian health services are primarily government-funded. NSW, a state that accounts for approximately one-third of the national population, delivers hospital and community services through

15 geographically organized Local Health Districts and three Specialty Health Networks. These health districts and networks are responsible for physical care, including hospital and some outpatient care, as well as mental health care. State government-operated community mental health services are organized around geographical catchment areas, are free of charge and can be accessed without referral by a General Practitioner (primary care physician). Private office-based primary and specialist care, private hospital care, and pharmaceuticals are funded or subsidized by the Australian Federal Government, with a varying degree of consumer co-payment. Referral by a General Practitioner is required to access subsidized private specialist care. Private hospitals mainly provide non-emergency care (including voluntary mental health care) for individuals with private health insurance and who choose not to use the public system. During the study period, private hospitals accounted for 23% of total acute overnight hospital episodes in NSW and 27% of acute overnight hospital days [17]. Mental health care is delivered to admitted patients and in community mental health services. Community mental health services primarily serve people with diagnoses of psychosis, persistent mood disorders, and personality disorders.

Data Linkage. This study was conducted as part of the NSW Health *Mental Health Living Longer* program, which uses data linkage to examine health outcomes among mental health service users. Data from NSW public hospitals, private hospitals, public community mental health services, and the NSW Register of Births, Deaths and Marriages were linked by the NSW Centre for Health Record Linkage (CHeReL; www.cherel.org.au), using probabilistic record linkage based on individuals' names, date of birth, addresses, and health service identifiers. The linkage process is designed to give a false-positive linkage rate of approximately five per 1,000 records. Data sets and linkage methods have been

described in full elsewhere [18]. A detailed description of the data linkage process, with videos and diagrams, can be found at https://www.cherel.org.au/our-services.

Mental health status was modelled as a time-dependent variable, with events (hospitalisations) and exposure time (person-years) calculated from the date of each person's index mental health contact during the study period, or from the study start date (January 1, 2017) if their index contact occurred during the two-year pre-study look-back period. Deaths occurring during the study period were identified by linkage to the NSW Register of Births, Deaths and Marriages. For deceased individuals, time from the date of death to the study end was excluded when calculating hospitalization rates.

Participants. NSW residents aged 18-100 years were included. Mental health service use was defined as any contact with an in-scope mental health service in the two-years prior to a hospitalization with malnutrition. In-scope services included: (i) admission to a NSW public or private hospital involving at least one day in a designated mental health unit, (ii) hospital admission with a primary diagnosis of a non-organic mental health condition (International Classification of Diseases [ICD-10], 10th Edition, codes F10-F99) [19], or (iii) face-to-face or telephone contact with a NSW state government-operated community mental health service. No data were available for mental health contacts that occurred in primary care or Commonwealth (national) government-funded services. Non-mental health service users were all other NSW residents who did not meet mental health service use criteria.

Mental health service users were sub-grouped into those with severe and persistent mental illness and those with other mental illnesses. Severe and persistent mental illness was defined as: (i) any diagnosis of a psychotic disorder, including schizophrenia, schizoaffective disorder, brief or atypical psychoses,

mania, bipolar disorder, and psychotic depression (ICD-10 codes F20-29, F30-31, F32.3 and F33.3), or (ii) two or more years of contact with mental health services, based on dates of first and last contacts during the observation and lookback periods. Other mental illnesses included all mental health service users with non-organic mental health diagnoses (ICD-10 codes F00-F09) who did not meet criteria for severe and persistent mental illness.

Outcome Measures. The primary outcome was rate of hospital admissions with a primary or secondary diagnosis of malnutrition for mental health service users compared to non-mental health service users. Malnutrition was defined using ICD-10 diagnostic codes E40–E46 *'Malnutrition'* [19]. Diagnoses in NSW hospital data are coded at discharge by trained health information managers and recorded using the ICD-10 Australian Modification [20]. Each hospital admission has one primary diagnosis and up to 50 additional diagnoses and/or external cause codes. Episodes were excluded if the person's residential address was outside NSW, if the person was under 18 or over 100, or if socioeconomic disadvantage or sex data were missing.

Age and sex were defined using the values recorded in the hospital admission record. Medical comorbidities at each admission were calculated using the Charlson Comorbidity Index [21, 22], a weighted scoring system where each comorbidity has an assigned weight. The total score is the sum of weighted scores, and categorized as 0, 1, or ≥2. Socioeconomic disadvantage was estimated from the person's area of residence using the Australian Bureau of Statistics Index of Relative Socioeconomic Disadvantage (IRSD) [23]. This index scores Australian geographical areas using 17 census-derived variables measuring income, welfare support, education, home ownership, employment, household

structure and English language proficiency. Scores were divided at quintiles to create five groups of roughly equal population size.

Data Analysis. The primary and secondary outcomes were rate of malnutrition identified during hospitalization, expressed as number of hospitalizations per 100,000 person years, and number of bed-days associated with malnutrition per 100,000 person years, respectively. Rates and 95% confidence intervals were calculated assuming a gamma distribution. Rates were compared using direct standardization against the overall NSW population. Two adjusted Incidence Rate Ratios (aIRR) were estimated using regression models including: (i) age and sex, and (ii) age, sex, and socioeconomic status as covariates. Subgroup analyses were performed for people with severe and persistent mental illness compared to other mental illnesses.

Three sensitivity analyses were conducted. First, we excluded people with a diagnosis of an eating disorder (ICD-10 codes F50.0-F50.9) in any hospital contact during the lookback or observation period. Second, we excluded episodes with a primary diagnosis of a non-organic mental health condition (ICD-10 codes F00-F09) which were associated with a secondary diagnosis of malnutrition. Third, we excluded people who received a malnutrition diagnosis during an admission for mental health care. These sensitivity analyses were included due to the known relationships between eating disorders and organic mental health conditions, and malnutrition [24], and between episodes of mental health care and number of bed days [25, 26]. Data assembly was carried out in SAS® Enterprise Guide® v8.3 [27]. Standardization was performed in R (R Core Team, 2023). This study was reported in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [28].

Results

The mean NSW adult population (person years per year) during the study period was 6,130,937; 2.9% were mental health service users (see Figure 1 and Table 1). When compared to NSW population estimates for the mid-point of the study period (June 2018), mental health service users were more likely to be female, aged under 35, and residing in regions in the most disadvantaged two quintiles of the NSW population (see Table 1). For mental health service users, the most common mental health diagnoses were psychotic disorders (e.g., schizophrenia), anxiety and somatoform disorders (e.g., generalized anxiety disorder and factitious disorder), and non-psychotic mood disorders (e.g., major depressive disorder), and other mental health conditions including personality and drug-related disorders (see Supplementary Table 1). People with severe and persistent mental illness represented 34% of mental health service users and accounted for 44% of person-years. We identified 128,564 hospitalizations with a diagnosis of malnutrition during the study period. Of these, we excluded 3,995 hospitalizations, leaving 124,569 hospitalizations (see Figure 1, Table 2 and Supplementary Tables 2-3). There were 2,033,625 bed-days associated with these hospitalizations (see Supplementary Tables 4-5).

Insert Tables 1-2 and Figure 1 about here

10,700 mental health service users experienced 12,841 admissions with malnutrition, or 15% of all NSW admissions with malnutrition. Their unadjusted incidence rate (3,526 per 100,000 person years) was 5.95 times higher than that of other NSW residents (593 per 100,000). After adjustment for age, sex, and socioeconomic disadvantage, mental health service users were 7.76x more likely to experience an admission with malnutrition (aIRR = 7.76, 95% CI 7.74 to 7.77). In subgroup analyses, adjusted rates were slightly lower in the severe and persistent mental illness subgroup (aIRR = 6.50, 95% CI (6.47 to

220 6.52) compared to the other mental illnesses subgroup (aIRR = 8.92, 95% CI 8.90 to 8.94), with rates in
221 both mental health service user subgroups being significantly higher than non-mental health service
222 users (see Table 3).
223
224 *Insert Table 3 about here*
225
226 Mental health service users had 8.70x more malnutrition-related bed-days than non-mental health
227 service users in the unadjusted model. After adjustment for age, sex, and socioeconomic disadvantage,
228 the rate increased in mental health service users (aIRR = 11.44, 95% CI 11.43 to 11.44). In subgroup
229 analyses, adjusted rates were slightly lower in the severe and persistent mental illness group (aIRR =
230 11.53, 95% CI 11.53 to 11.54) compared to the other mental illnesses subgroup (aIRR = 11.62, 95% CI
231 11.61 to 11.62), with rates in both mental health service user subgroups being significantly higher than
232 non-mental health service users (see Table 4).
233
234 *Insert Table 4 about here*
235
236 In sensitivity analyses, excluding people with an eating disorder diagnosis (n=661) had a small-to-
237 negligible effect on rates of admissions with malnutrition (updated aIRR = 7.35, 95% CI 7.34 to 7.37) and
238 number of bed-days associated with malnutrition (updated aIRR = 10.80, 95% CI 10.79 to 10.80) (see
239 Supplementary Tables 6-7). Excluding episodes with a primary diagnosis of an organic mental health
240 condition (n=2,862) had negligible effects on the incidence of admissions with malnutrition (aIRR = 7.65,
241 95% CI 7.63 to 7.67) and the number of bed-days (aIRR = 11.24, 95% CI 11.23 to 11.24) in mental health
242 service users compared to non-mental health service users (see Supplementary Tables 8-9). Excluding

243 malnutrition diagnoses linked to admissions for mental health care (n=3,903) reduced the incidence of
244 admissions with malnutrition (aIRR = 6.33, 95% CI 6.31 to 6.35) and the number of bed-days (aIRR =
245 8.08, 95% CI 8.07 to 8.08) in mental health service users compared to non-mental health service users
246 (see Supplementary Tables 10-11).
247

248 **Discussion**

249 To our knowledge, this is the first population-based study to quantify rates of clinically diagnosed
250 malnutrition identified during hospital admissions among people who use mental health services. In our
251 population of over 6 million, hospital admissions with a primary or secondary diagnosis of malnutrition
252 were common, with more than 41,000 hospital admissions and more than 677,000 associated bed days
253 annually. Mental health service users made up around 3% of total NSW residents but accounted for 14%
254 of total admissions where malnutrition was identified. After adjusting for age, sex and socioeconomic
255 disadvantage, mental health service users were 7.76 times more likely to have malnutrition identified
256 during an admission and spent 11.44 times more days in hospital during those admissions, compared to
257 other NSW residents.
258

259 A growing body of literature has examined nutritional vulnerability and malnutrition risk among people
260 with mental illness, particularly through the use of screening tools in inpatient and community mental
261 health settings [15, 16]. While screening studies identify individuals at risk of malnutrition, our
262 population-wide analysis demonstrates that clinically diagnosed malnutrition is also being identified
263 during routine hospital admissions, and that this occurs at substantially higher rates among mental
264 health service users than among the general population. Together, these bodies of evidence suggest a

continuum from nutritional risk to clinically recognized malnutrition, reinforcing the need for systematic screening, prevention, and early intervention across mental health and general hospital settings.

Malnutrition is a serious medical problem, and its consequences are well described in many vulnerable groups such as older adults [29], and in certain disease states and conditions such as cancer [30] and burns [31]. Our findings suggest that malnutrition in people who use mental health services may be a significant and under-examined issue. In general, malnutrition during admissions leads to higher bed days, readmission rates, healthcare costs, and rates of mortality in the following years [32]. For people who use mental health services, malnutrition may affect treatment response and exacerbate physical health disparities. Malnutrition may alter the pharmacokinetics and pharmacodynamics of psychiatric and physical health medications, reducing efficacy [33]. Malnutrition may also contribute to fatigue, cognitive dysfunction, and physical deconditioning, further limiting engagement in care and self-management [29].

In our study, only around 10% of instances of malnutrition in mental health service users identified during admission involved at least one mental health bed day. This suggests the need for appropriate screening and support in general hospital settings that incorporate the psychological and mental illness related factors that may contribute to malnutrition, beyond traditional risk factors. Additionally, there is a need for enhanced collaboration between mental health services, general hospital services and emergency departments, including routine nutrition screening by liaison psychiatry and allied health teams. Hospitals frequently include policies on malnutrition screening [34]. Given our findings, exploration is needed as to whether screening parameters are optimal for mental health service users, and whether the current support offered is acceptable and effective. For inpatient, outpatient and

community mental health services, screening and support need to target the broad range of nutrition-risks experienced by this population group to improve nutritional status [35].

Our findings highlight the importance of screening for nutritional status and its impact on the physical health of mental health service users in community settings. While mental health services may already screen some groups such as people with eating disorders or enduring psychosis, our findings suggest a broader need. We found that increased risk of malnutrition was present across the spectrum of mental health conditions, with elevated rates in people living with severe or persistent mental illnesses such as psychosis, but also in people with other diagnoses or brief service contact. The excess malnutrition-related hospital admissions in mental health service users weren't accounted for by the presence of eating disorders such as anorexia nervosa, which only accounted for around 1% of malnutrition-related admissions in this adult cohort.

The relationship between nutrition status and mental health conditions is likely to be complex, involving shared risk factors–such as poverty, housing instability, social isolation, weight stigma and barriers to accessing support–as well as the direct effects of mental health conditions and their treatment on nutrition [36, 37]. However, it is also important to consider the possible impacts of malnutrition on the course and treatment of mental health conditions. It has been argued that poor diet quality and nutrition may play a directly causal role in some mental health conditions including depression [38, 39].

The observed pattern of lower area-level deprivation among mental health service users with malnutrition-related hospitalisations, and the comparatively lower rates in the SPMI subgroup, likely reflect differences in pathways to care and diagnostic recognition rather than lower underlying risk.

Together, these findings suggest that malnutrition in this population arises through heterogeneous mechanisms, extending beyond socioeconomic disadvantage alone

This study had several strengths. The use of data from public and private hospitals allowed us to provide a comprehensive, system-wide estimate of rates of malnutrition being identified during hospital admissions that are not limited by sample size, setting, or clinician bias introduced when only using a small number of assessors. Further, this study represents routine clinical care and coding practices that is not influenced by a controlled research protocol. Overall, this means the findings are more representative and more generalizable to the wider population compared to smaller screening and/or assessment studies.

The study needs to be interpreted in the context of the following limitations. The use of ICD-10-AM diagnosis codes likely underestimates the true prevalence of malnutrition, as coding depends on clinical recognition and documentation; however, restricting the definition to E40-E46 prioritized specificity and ensured consistency with prior population-based studies. Further, the data does not specify which diagnostic elements informed each malnutrition diagnosis and BMI information was not available, making it unclear whether diagnoses were based on traditional underweight-centered criteria or a more inclusive framework that recognizes malnutrition across the weight spectrum. This distinction is clinically relevant given that elevated body weight in people with mental illness is common, and is impacted by symptomatology, psychotropic medications, and socioeconomic disadvantage. The linked dataset does not include information from primary care, private office-based specialists or national government-funded physical healthcare services. Therefore, the mental health service user group may be biased to more acute and severe mental health conditions. Findings may not be generalizable to

334 countries with different hospital systems, coding practices, or malnutrition prevalence. Socioeconomic
335 disadvantage was measured using area-level indices rather than individual-level variables which were
336 unavailable, such as income and education. In addition, while Charlson Comorbidity Index was
337 calculated for admitted individuals, equivalent population-level denominator data were unavailable and
338 therefore rates could not be standardized or adjusted for comorbidity burden. As a result, some of the
339 observed differences may partially reflect broader physical health comorbidity in mental health service
340 users. Finally, variation in coder interpretation and coding practices may introduce misclassification bias.
341
342 Future research should determine the most accurate approach to determining malnutrition in mental
343 health service users and understand the factors underpinning malnutrition across the weight spectrum
344 to fully understand malnutrition in this population group. In addition, future research will need to
345 explore whether readmission and mortality after a malnutrition is identified during a hospital admission
346 is higher in mental health service users compared to non-mental health service users. Further, it is
347 important to understand which mental health service users are most at risk of malnutrition to assist in
348 prevention and early identification. This may help increase understanding of the relationship between
349 malnutrition and higher rates of food insecurity [10], disordered eating [6, 7, 13] or suboptimal dietary
350 intake [8] in this population group. Targeted nutrition-risk screening tailored to mental health settings is
351 needed. An international network of mental health dietitians and other mental health professionals is
352 developing such a tool using a structured, staged and iterative process [40]. This risk screener, targeted
353 to mental health service users, may assist in identifying more opportunities for prevention and early
354 intervention via mental health services.
355

In practice, clinical nutrition professionals need to ensure they have a foundational understanding of mental disorders to ensure adequate assessment, appropriate communication and effective intervention. Care plans and handovers should consider including both primary care and secondary mental health services. Further, mental health services are transitioning to whole-of-body care [1, 41], and often include nutrition professionals upskilled in mental health [42], providing an ideal scenario for ongoing community-based care.

Conclusion

Mental health service users have higher rates of malnutrition identified during hospital admissions, and subsequently a longer length of stay, compared to non-mental health service users, irrespective of whether the admission is for an episode of mental health or physical health care. Future studies should examine which diagnostic factors contribute to the higher rates of diagnoses, and why they occur, to inform effective prevention and early identification strategies.

Declarations

Declaration of interests. None to declare.

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Author contributions. All authors contributed to the conception and design, analysis approach, interpretation, and drafting or revising for intellectual content. All authors approved the final version to

be published and agree to be accountable for all aspects of the work. No one eligible for authorship has been excluded from the list of authors.

Author contributions according to the CRediT author statement. **SBT**: Conceptualization, Methodology, Formal Analysis, Investigation, Writing – Original Draft, Supervision, Project Administration, Funding Acquisition. **JJ**: Methodology, Software, Validation, Formal Analysis, Investigation, Data Curation, Writing – Review & Editing, Visualization, Project Administration. **PG**: Conceptualization, Methodology, Software, Validation, Investigation, Resources, Writing – Review & Editing, Supervision, Funding Acquisition. **IS:** Conceptualization, Methodology, Writing – Review & Editing, Funding Acquisition. **RF:** Conceptualization, Methodology, Writing – Review & Editing, Funding Acquisition. **KD:** Conceptualization, Methodology, Writing – Review & Editing, Funding Acquisition. **HF:** Conceptualization, Methodology, Writing – Review & Editing, Funding Acquisition. **JC:** Conceptualization, Methodology, Writing – Review & Editing, Funding Acquisition. **PBW:** Conceptualization, Methodology, Writing – Review & Editing, Funding Acquisition, Supervision. **GS:** Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Data Curation, Writing – Review & Editing, Supervision, Project Administration, Funding Acquisition.

Data sharing statement. No data are available. Access to NSW Health data is available to researchers only with the specific approval of the NSW Population and Health Services Research Ethics Committee (www.cancer.nsw.gov.au/research-and-data/nsw-population-health-services-research-ethics-com). That approval does not permit sharing of unit record data with other researchers.

Ethical approval. Ethics approval was granted by the NSW Population and Health Service Research Ethics Committee (HREC/17/CIPHS/48. CINSW Refs 2017/HRE1105, 2019/UMB0208). Oversight was provided by a steering committee which included representatives from peak organizations for NSW Health consumers, mental health service users, and mental health carers.

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Figure Legend and Table Headings.

Figure 1. Identification of hospitalizations with malnutrition and person count for mental health service users and non-mental health service users.

Table 1. Mean person-years in NSW residents during 2017-2019 for mental health service users and non-mental health service users.

Table 2. Hospitalisations with malnutrition in NSW residents for the 2017-2019 period, by mental health service use group, and demographic and primary diagnostic stratum.

Table 3. Hospitalisations with malnutrition for primary and subgroup analyses.

Table 4. Malnutrition-related bed-days for primary and subgroup analyses.

Table 1. Mean person-years in NSW residents during 2017-2019 for mental health service users and non-mental health service users.

	Person years (average/year)			
	Non-MHSU		MHSU	
Characteristic	**Number**	**(%)**	**Number**	**(%)**
All	5,955,186	100%	177,751	100%
Sex				
Female	3,031,446	51%	90,822	52%
Male	2,923,740	49%	84,929	48%
Age group (years)				
18-24	629,485	11%	30,373	17%
25-34	1,158,875	19%	37,089	21%
35-44	1,023,107	17%	35,298	20%
45-54	972,871	16%	29,594	17%
55-64	909,492	15%	19,903	11%
65-74	705,578	12%	12,137	7%
75-84	387,226	7%	7,528	5%
85+	168,552	3%	3,829	2%
Sociodemographic disadvantage				
1 (most disadvantaged)	1,075,275	18%	38,505	22%
2	1,034,781	17%	35,745	20%
3	1,253,835	21%	37,632	21%
4	1,207,884	20%	32,364	18%
5 (least disadvantaged)	1,383,422	23%	31,505	18%

MHSU: Mental health service user; Non-MHSU: Non-mental health service user.

Table 2. Hospitalisations with malnutrition in NSW residents for the 2017-2019 period, by mental health service use group, and demographic and primary diagnostic stratum.

	Hospitalisations with malnutrition			
	Non-MHSU		MHSU	
Characteristic	**Number**	**(%)**	**Number**	**(%)**
Sex				
Female	52,205	49%	9,611	52%
Male	53,768	51%	8,985	48%
Age group				
18-24	741	1%	1,010	5%
25-34	1,284	1%	1,028	6%
35-44	2,051	2%	1,392	8%
45-54	4,955	5%	2,532	14%
55-64	11,771	11%	3,596	19%
65-74	21,571	20%	3,787	20%
75-84	31,605	30%	3,299	18%
85+	31,995	30%	1,952	10%
Sociodemographic disadvantage				
1 (Most disadvantaged)	23,311	22%	3,941	21%
2	20,257	19%	3,180	17%
3	20,615	19%	3,810	20%
4	21,719	20%	3,775	20%
5 (Least disadvantaged)	20,071	19%	3,890	21%
Charlson score				
0	29,260	28%	7,313	39%
1	21,920	21%	4,130	22%
2+	54,793	52%	7,153	38%
Primary diagnosis category				

	Hospitalisations with malnutrition			
	Non-MHSU		MHSU	
Characteristic	**Number**	**(%)**	**Number**	**(%)**
Cancer	15,843	15%	1,299	7%
Digestive	14,317	14%	2,467	13%
Other	13,607	11%	2,340	13%
Respiratory	13,783	13%	1,670	9%
Cardiac and circulatory	11,747	11%	1,268	7%
Injuries and accidents	12,209	12%	1,728	9%
Infectious	6,240	6%	769	4%
CNS	4,928	5%	936	5%
Musculoskeletal	4,924	5%	655	4%
Other factors influencing	6,097	6%	991	5%
Mental and behavioral	2,278	2%	4,473	24%

CNS: Central nervous system; MHSU: Mental health service user; Non-MHSU: Non-mental health service user.

Table 3. Hospitalisations with malnutrition for primary and subgroup analyses.

Group	Malnutrition episodes	Rates per 100,000 person years	Incidence Rate Ratio		
			Unadjusted	aIRR-1	aIRR-2
Non-MHSU	105,973	593 (590-597)	1.00	1.00 (1.00-1.00)	1.00 (0.99-1.01)
MHSU	18,596	3,526 (3,476-3,577)	3.09	5.95 (7.72- 7.73)	7.76 (7.74-7.77)
Subgroup					
SPMI	7,152	3,078 (3,007-3,150)	5.19	6.50 (6.49-6.51)	6.50 (6.47-6.52)
Other MH	11,444	3,879 (3,808-3,951)	6.54	8.81 (8.80-8.82)	8.92 (8.90-8.94)

aIRR-1: adjusted for age and sex, aIRR-2: adjusted for age, sex and disadvantage. aIRR: adjusted incidence rate ratio; malnutrition: Protein-energy malnutrition; MHSU: Mental health service user; Non-MHSU: Non-mental health service user.

Table 4. Malnutrition-related bed-days for primary and subgroup analyses.

Group	Bed days	Rates per 100k	Incidence Rate Ratio		
			Unadjusted	aIRR-1	aIRR-2
Primary Analysis					
Non-MHSU	1,618,210	9,058 (9,044-9,072)	1.00	1.00 (1.00-1.00)	1.00 (1.00-1.00)
MHSU	415,415	78,770 (78,531-79,010)	8.70	11.28 (11.28-11.28)	11.44 (11.43-11.44)
Subgroup Analysis					
SPMI	189,730	81,660 (81,292-82,028)	9.02	11.34 (11.33-11.34)	11.53 (11.53-11.54)
Other MH	225,685	76,459 (76,180-76,811)	8.45	11.41 (11.41-11.41)	11.62 (11.61-11.62)

aIRR-1: adjusted for age and sex, aIRR-2: adjusted for age, sex and disadvantage